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(54) A weft inserting nozzle or an air jet type weaving loom

(57) A weft inserting nozzle (10) has a weft guiding hole (A) through which a weft (W) is passed, an annular air jet opening (B) defined around the exit of the hole (A), and a second opening (C) extending coaxially and downstream from the annular opening (B), the second hole (C) consisting of an upstream first section (25, 36a) and a downstream second section (36b) each having a uniform diameter throughout the length thereof, and in which the diameter of the second section (36b) is greater than that of the first section (36a) which is equal to the outer diameter of the annular air jet opening (B). The second opening (C) may be in a separate member (Figure 3).

FIG.1

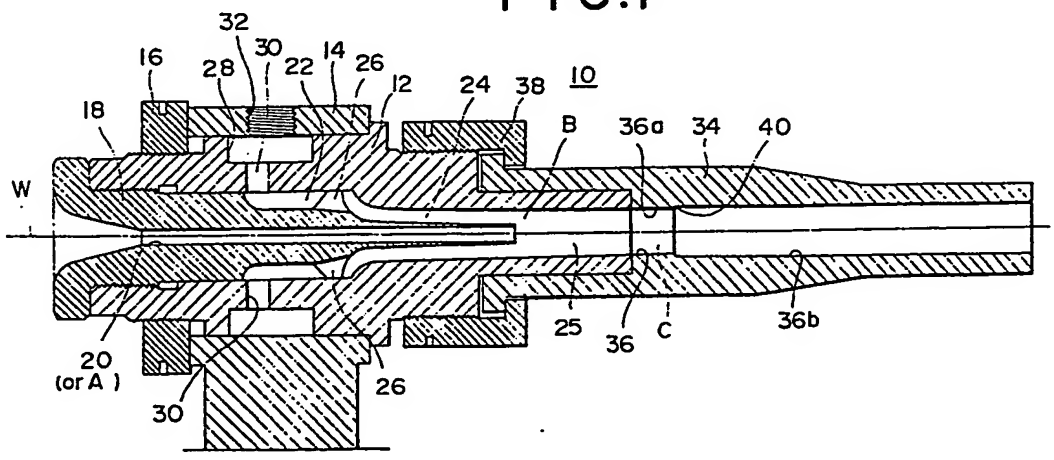

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FIG.1

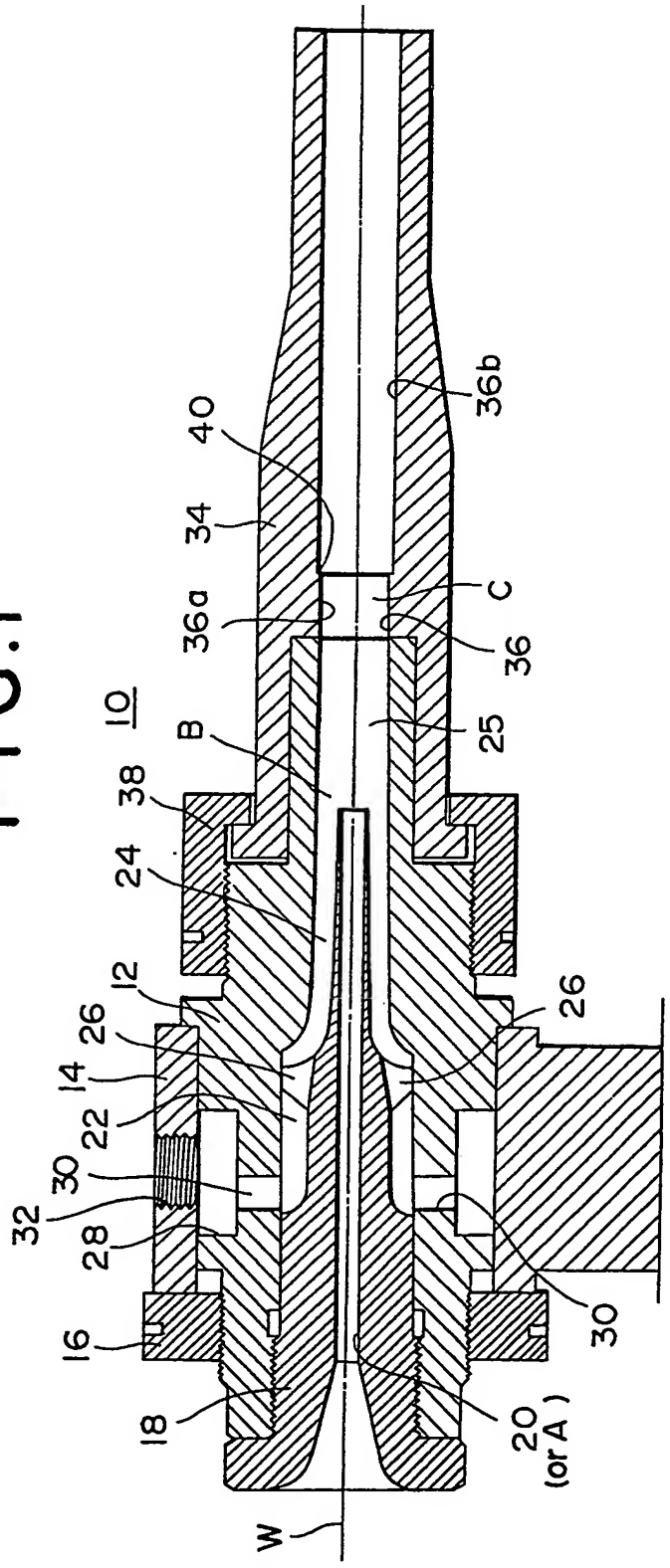

40
34
36a
B
10
38
24
12
26
14
22
30
32
28
16
18
W
20
(or A)
30
26
25
36
C
36b

FIG.2

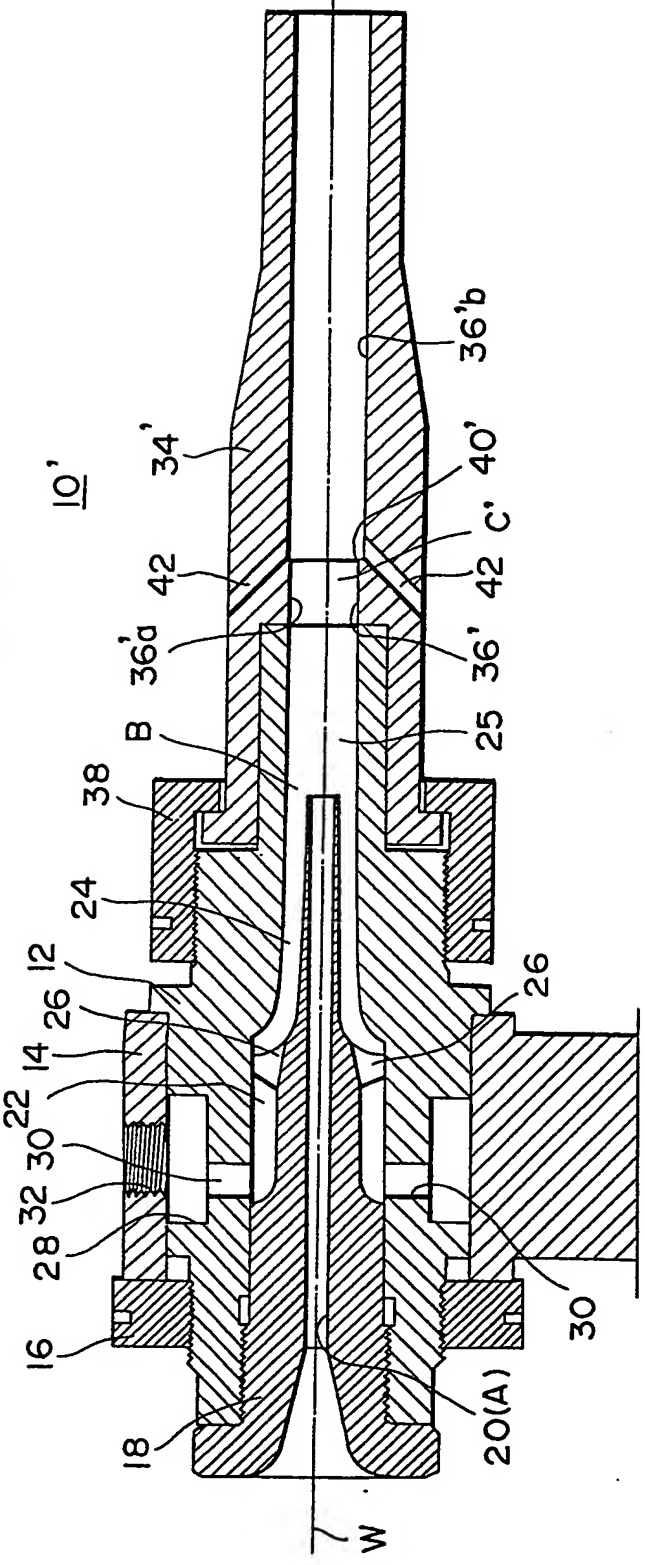
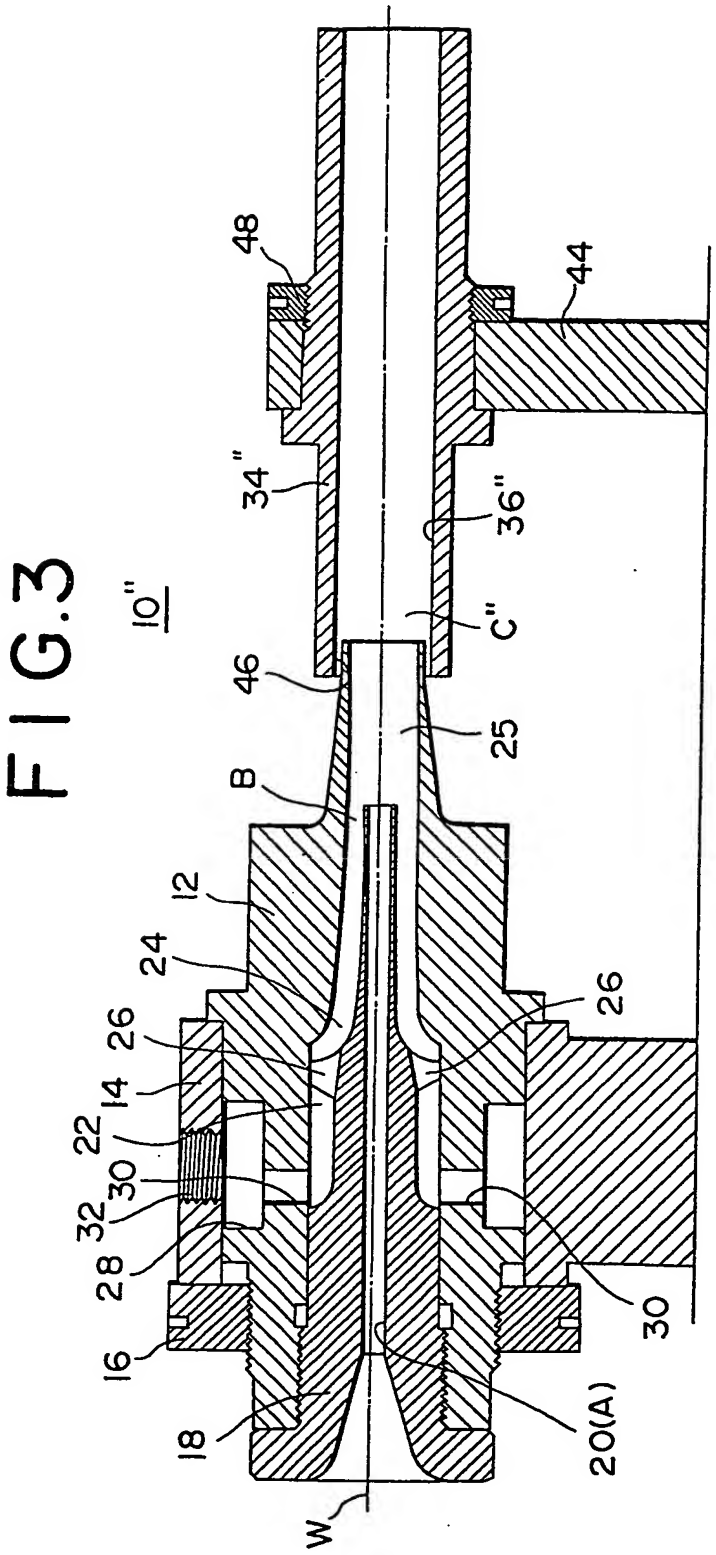

10'
34'
36'b
40'
C'
42
42
36'a
36'
B
25
38
24
12
26
26
14
22
30
32
28
16
18
20(A)
30
W

FIG.3



SPECIFICATION

A weft inserting nozzle of an air jet type weaving loom

The present invention relates in general to a weft picking device of an air jet type weaving loom in which a weft yarn is adapted to be blown into the warp shed by means of air jet action, and more particularly to an improvement in a weft inserting nozzle of the weft picking device.

Many types of weft inserting nozzles are known and practically used in a field of air jet type weaving looms. One of them is of a type comprising generally a weft inserting tube through which is passed a weft yarn, a first chamber section coaxially surrounding the tube to form an annular air jet opening about the tip of the tube, and a second chamber section extending coaxially and downstream from the air jet opening. In this type nozzle, there are two ways for increasing the traction force applied to the weft yarn for the weft yarn picking. One is to increase the velocity of air ejected or jetted from the air jet opening and the other is to increase the longitudinal length of the second chamber section. The former way, however, sometimes causes an easy breakage of the weft yarn because of difficulty in setting the air velocity at the optimum value. Thus, it is generally known that the latter way is more practical than the former way.

However, the latter way, that is to increase the longitudinal length of the second chamber section, tends to bring about a slack of the weft yarn in the nozzle, originating from a difference in traction force between the force applied to the weft yarn within the nozzle and the force applied to the weft yarn just issued from the nozzle. In fact, during flow through the elongated second chamber section, the air is gradually accelerated pulling steadily the weft yarn out from the weft inserting tube. But, upon ejection from the nozzle, the air is compelled to collide against the surrounding air thus reducing its velocity, so that the weft yarn just issued from the nozzle decreases its velocity. Thus, the weft yarn in the second chamber section is subjected to contraction, producing undesired slack. Further, the latter way tends to cause the weft yarn in the nozzle to untwist especially when it is exposed to a high velocity air throughout a long length thereof. Furthermore, using the latter way induces a possibility of back flow of air toward the first chamber section, which of course prevents the weft yarn from being optimally picked into the warp shed.

Therefore, it is an essential object of the present invention to provide an improved weft inserting nozzle which is free of the above-mentioned problems.

According to the present invention, there is provided a weft inserting nozzle of an air jet type weaving loom. The nozzle comprises a weft inserting first hole through which a weft yarn is adapted to pass, around the exit of the first hole an annular air jet opening from which pressurized air is ejected downstream for drawing the weft yarn from the first hole, and a weft inserting second hole which coaxially and downstream extends from the annular air jet opening, wherein the second hole consists of an upstream positioned first section and a downstream positioned second section each having a uniform diameter throughout the length thereof, the diameter of the second section being greater than that of the first section.

In the accompanying drawings:—

Fig. 1 is a sectional view of a weft inserting nozzle, which is a first embodiment of the present invention;

Fig. 2 is a view similar to Fig. 1, but showing a second embodiment of the present invention; and

Fig. 3 is a view similar to Fig. 1, but showing a third embodiment of the present invention.

The weft inserting nozzle 10 of the first embodiment shown in Fig. 1 comprises a cylindrical hollow body 12 tightly held by a holder 14. Designated by numeral 16 is a ring connector which screwed on the hollow body 12 to assure a tight connection between the hollow body 12 and the holder 14. The hollow body 12 has a longitudinally extending through hole which consists of a larger diameter section and a smaller diameter section, as shown. Screwed into the through hole of the hollow body 12 is a weft inserting body 18 which has a longitudinally extending passage 20 (or first weft inserting hole A) through which a weft yarn W is to be passed. The entrance of the passage 20 is formed into a frustoconical shape for achieving easy and reliable insertion of the weft yarn thereinto. As shown, the weft inserting body 18 includes a larger diameter section screwed into the larger diameter section of the hollow body's through hole, a medium diameter section spacedly disposed within the remaining part of the larger diameter section of the hollow body's through hole, and a smaller diameter section spacedly disposed within the smaller diameter section of the hollow body's through hole. With this construction, there are formed mutually-communicated first and second tubular spaces 22 and 24 around the medium and smaller diameter sections of the weft inserting body 18, respectively. As shown, the smaller diameter section of the weft inserting body 18 is so located as to leave a considerable space 25 between the tip thereof and the exit of the smaller diameter section of the through hole of the hollow body 12. Equally spaced air stabilizers 26 are provided on the medium diameter section of the weft inserting body 18.

The cylindrical hollow body 12 is formed about the outer surface thereof with an annular groove 28 which is communicated with the first tubular space 22 through a plurality of radial holes 30 formed in the hollow body 12. The annular groove 28 is connected to a known air supply source (not shown) through an opening 32 formed in the holder 14, so that pressurized air from the air source is supplied to the groove 28 and thus to the second tubular space 24. With this construction, there is formed, around the top of

the smaller diameter section of the weft inserting body 18, a so-called air jet opening B from which the pressurized air is ejected or jetted toward the hole 25.

A tubular body 34 having a longitudinally extending through hole 36 is connected to the hollow body 12 in a manner to coaxially extend therefrom. As shown, the connection between them is such made that a sleeve-shaped tip portion of the holllow body 12 is snugly received in an enlarged entrance section of the tubular body's through hole 36. Designated by numeral 38 is a coupler for securing the tubular body 34 to the hollow body 12. Now, it is to be noted that the hole 25 of the hollow body 12 and the hole 36 of the tubular body 34 constitute a second weft inserting hole C which will be described hereinafter.

As shown, the hole 36 of the tubular body 34 has at its upstream part a first section 36*a* which has the same diameter as that of the hole 25 of the hollow body 12, and at its downstream part a second section 36*b* which has a larger diameter than the first section 36*a*. Designated by numeral 40 is a stepped portion from which the second section 36*b* extends.

Operation will be described in the following.

Under weft yarn picking, the pressurized air from the air supply source is intermittently supplied to the second tubular space 24 through the annular groove 28, the radial holes 30, the first annular space 22 and the air stabilizers 26. The pressurized air thus reaching the second tubular space 24 is ejected or jetted from the air jet opening B toward the second weft inserting hole C. With this air jet, the weft yarn W in the first weft inserting hole A is drawn out downstream toward the second weft inserting hole C.

During flow through the through hole 36 of the tubular body 34, the air is subjected to expansion at the second section 36*b* because of its enlarged construction, so that the air velocity at that section is considerably decreased suppressing excess air acceleration, resulting in that the ratio of the weft yarn velocity at the exit of the hole 36 to that at the entrance of the same is considerably decreased. Since the velocity reduction of the weft yarn W in the second weft inserting hole C is gradually or smoothly made, the undesired slack of the weft yarn does not occur. It has been revealed that the other two undesired phenomena, which are the untwisting of the weft yarn and the back flow of air, hardly occur.

Referring to Fig. 2, there is shown a second embodiment of the present invention. The nozzle 10′ of this embodiment has substantially the same construction and parts as those of the first embodiment except for the construction of the tubular body 34′. As shown, in the second embodiment, a plurality of air introducing holes 42 are formed in the tubular body 34′ in a manner to diagonally extend from the stepped portion 40′ to the outer surface of the body 34′. Each hole 42 is inclined upstream with respect to the axis of the second weft inserting hole C′. With this construction, the energy loss of air caused by air vortex appearing at the stepped portion 40′ is minimized. In fact, during the air flow through the hole 36′, there is produced a negative pressure in the hole 36′, so that the surrounding air is sucked through the introducing holes 42 into the hole 36′ to suppress generation of the undesired vortex flow. With this construction having the air introducing holes 42, the air flow amount is increased thereby increasing the traction force applied to the weft yarn W travelling through the nozzle 10′.

Referring to Fig. 3, there is shown a third embodiment of the present invention. The nozzle 10″ of this embodiment is a modification of the nozzle 10′ of the second embodiment. In the third embodiment, a separate tubular body 34″ having a straight through hole 36″ is tightly held by a holder 44. Designated by numeral 48 is a ring connector for securing the tubular body 34″ to the holder 44. As shown, the through hole 36″ of the tubular body 34″ has throughout the whole length thereof a uniform diameter larger than that of the smaller diameter section of the hollow body 12. The sleeve-shaped tip portion of the hollow body 12 is spacedly disposed in the entrance of the tubular body's through hole 36″, leaving an annular clearance 46 therebetween. It is to be noted that the hole 25 of the hollow body 12 and the hole 36″ of the tubular body 34″ constitute the second weft inserting hole C″. With this construction, substantially the same effect as that of the second embodiment is achieved.

CLAIMS

1. A weft inserting nozzle of an air jet type weaving loom, comprising:

a weft inserting first hole through which a weft yarn is adapted to pass;

around the exit of said first hole an annular air jet opening from which a pressurized air is ejected downstream for drawing the weft yarn out downstream from the first hole; and

a weft inserting second hole which coaxially and downstream extends from said annular air jet opening,

wherein said second hole consists of an upstream positioned first section and a downstream positioned second section each having a uniform diameter throughout the length thereof, the diameter of said second section being greater than that of said first section.

2. A weft inserting nozzle as claimed in Claim 1, in which the second hole is formed by a tubular body having a longitudinally extending hole which constitutes both the first and second sections, said tubular body being connected to the air jet opening in such a manner that the longitudinally extending hole is aligned with the annular air jet opening.

3. A weft inserting nozzle as claimed in Claim 2 further comprising a passage through which an upstream portion of said second section of said second hole is communicated with the open air.

4. A weft inserting nozzle as claimed in Claim 3,

in which the passage comprises a plurality of air introducing holes which are formed in said tubular body to communicate a stepped portion where said first and second sections are bounded with the open air.

5. A weft inserting nozzle as claimed in Claim 4, in which each of said air introducing holes is inclined upstream with respect to the axis of said second hole of said tubular body.

6. A weft inserting nozzle as claimed in Claim 1, in which said first section comprises a hole which is formed in the air jet opening at a position downstream of the exit of said first hole, and in which said second section comprises a longitudinally extending hole formed in a tubular body, said tubular body being arranged in such a manner that the longitudinally extending hole thereof is aligned with said hole which constitutes said first section.

7. A weft inserting nozzle as claimed in Claim 6, further comprising a passage through which an upstream portion of said second section is communicated with the open air.

8. A weft inserting nozzle as claimed in Claim 7, in which said passage comprises an annular space which is defined between a tip of a sleeve portion in which the hole of said air jet opening is defined and an entrance of said tubular body.

9. A weft inserting nozzle as constructed and arranged substantially as described herein with reference to, and as illustrated in Fig. 1, or Fig. 2, or Fig. 3 of the accompanying drawings.

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